

Project Lead The Way® “Engineering Design and Development”
Technology Education – Applied Technology Education
Utah State Office of Education
CIP Code 210124

COURSE DESCRIPTION: This course lets student apply what they have learned in academic and pre-engineering course as they complete challenging, self-directed projects. Students work in teams to design and build solutions to authentic engineering problems. An engineer from the school’s partnership team mentors each student team. Examples of projects may include a robotic mascot for the school, a remote-controlled hovercraft, or a solar-powered device. Students keep journals of notes, sketches, mathematical calculations and scientific research. Student teams make progress reports to their peers, mentor and instructor and exchange constructive criticism and consultation. At the end of the course teams present their research paper and defend their projects to a panel of engineers, business leaders and engineering college educators for professional review and feedback. This course equips students with the independent study skills that they will need in post secondary education and careers in engineering and engineering technology.

STANDARD & OBJECTIVES

210124.01 INTRODUCTION ENGINEERING DESIGN AND DEVELOPMENT

- 210124.0101 Students will be able to describe and define the purpose and rationale of the course and the skills and knowledge base it is designed to present. (Justification of Course/Project)
- 210124.0102 Students will be able to describe the characteristics of a successfully completed project based on previously completed projects. (Justification of Course/Project)
- 210124.0103 Students will be able to distinguish the differences between the goals of this class and the type of projects done in other classes. (Justification of Course/Project)
- 210124.0104 Students will be able to describe and define the structure for evaluating a research project. (Review of Expectations)
- 210124.0105 Students will be able to list examples of levels of performance within the grading structure of this course. (Review of Expectations)
- 210124.0106 The students will be able to create a resume to record their academic achievements and extra-curricular activities in school. (Review of Expectations)
- 210124.0107 The students will begin to develop a portfolio of their past accomplishments and research project. (Review of Expectations)

210124.02 ELEMENTS OF FORMAL RESEARCH

- 210124.0201 Students will be able to recognize a need for retaining in one location all information relevant to the research project. (Dailey Research Journal)
- 210124.0202 Students will be able to identify information encountered in the research process that belongs in the journal. (Dailey Research Journal)
- 210124.0203 Students will design a format for the journal, which is well-organized and easy to use. (Dailey Research Journal)
- 210124.0204 Students will use their journal as the source for returning to any desired previously encountered information. (Dailey Research Journal)

- 210124.0205 Students will be able to use conventional library resources as a starting point for all research. (Conventional Library Resources)
- 210124.0206 Students shall be able to choose the appropriate media to obtain the desired information. (Conventional Library Resources)
- 210124.0207 Students will be able to distinguish relevant from irrelevant web sites. (Using The Computer as a Research Tool)
- 210124.0208 Students will be able to manipulate search engines to find specific information. (Using The Computer as a Research Tool)
- 210124.0209 Students will create strategies for identifying key terms that narrow their search topic. (Using The Computer as a Research Tool)
- 210124.0210 Students will examine on-line databases to search for patents, people, business, Government and Academic information. (Using The Computer as a Research Tool)
- 210124.0211 Students will correspond by E-mail including the use of attachments. (Using The Computer as a Research Tool)
- 210124.0212 Students will differentiate between an E-mail address and a Web site address. (Using The Computer as a Research Tool)
- 210124.0213 Students will be able to compose a business letter and a thank you letter. (Contacting The Experts)
- 210124.0214 Students will define the positive characteristics for personal interviewing. (e.g. courtesy, professionalism, listening skills, personal hygiene, etc.) (Contacting The Experts)
- 210124.0215 Students will develop communication skills that will allow them to converse over the phone and conduct a face-to-face interview. (Contacting The Experts)

210124.03 GUIDED RESEARCH

- 210124.0301 The learner will be able to use a decision matrix in narrowing a topic of research. (Methods of Brainstorming)
- 210124.0302 The students will be able to develop and define constraints and specifications for use in a decision matrix. (Methods of Brainstorming)
- 210124.0303 The student will be able to use a decision matrix to rank order alternatives. (Methods of Brainstorming)
- 210124.0304 The student will be able to use decision matrices to develop a concise problem statement. (Methods of Brainstorming)
- 210124.0305 The students will be able to discuss and explain key issues and terminology within their topic area. (Research The Topic)
- 210124.0306 The students will be able to narrow the topic focus using the decision matrix. (Research The Topic)
- 210124.0307 The students will be able to give an oral presentation. (Research The Topic)
- 210124.0308 Based on their research students will be able to develop a problem statement. (How To Write A Problem Statement)
- 210124.0309 The students will be able to apply the decision matrix to a problem, justifying their problem statements based on previous research findings and decision matrices. (How To Write A Problem Statement)
- 210124.0310 Students will be able to generate a list of existing solutions to their research problem. (Researching Alternative Solutions)
- 210124.0311 Using decision matrices, students will be able to evaluate the advantages and disadvantages of present solutions to their research problem. (Researching Alternative Solutions)

- 210124.0312 Following a review of the specifications and constraints identified in their decision matrices, students will be able to develop a list of alternative solutions to their stated problem. (Developing Alternative Solutions)
- 210124.0313 The students will be able to conduct preliminary patent searches to determine the originality of their alternative choices. (Redefining & Justifying Alternative Solutions)
- 210124.0314 The students will be able to conduct research to determine the merit of their alternative choices based on the state of the art in the field. (Redefining & Justifying Alternative Solutions)
- 210124.0315 Students will be able to identify techniques for delivering formal presentations. (Presentation Methods)
- 210124.0316 Students will be able to choose an appropriate formal presentation format and prepare their presentation. (Presentation Methods)
- 210124.0317 Students will be able to construct and deliver a PowerPoint presentation centered on their topic of research. (Presentation Methods)

210124.04 INDEPENDENT RESEARCH

- 210124.0401 The students will be able to define and demonstrate time management planning skills as they pertain to their project. (Independent Research)
- 210124.0402 The student will be able to identify methods and sources for obtaining materials and supplies. (Independent Research)
- 210124.0403 The student will complete an independent research project. (Independent Research)
- 210124.0404 The students will provide a detailed set of instructions for producing a testable prototype based upon their research and the information gained through their research. (Developing The Prototype)
- 210124.0405 The students will be able to identify safe practices for the use of tools and equipment. (Developing The Prototype)
- 210124.0406 The students will be able to create and justify a process for testing their prototype design that will yield valid data concerning the design's attempt at solving their problem statement. (Developing The Prototype)
- 210124.0407 The students will review their testing procedures to determine the validity of the testing procedures. (Developing The Prototype)
- 210124.0408 The students will be able to apply the appropriate statistical analysis tools to their test results to ensure their validity and significance. (Developing The Prototype)
- 210124.0409 The students will be able to identify, define, and implement needed modifications to their design based upon their ongoing research. (Developing The Prototype)
- 210124.0410 The students will be able to evaluate and explain the effectiveness of their design at solving the problem that they have defined. (Developing The Prototype)
- 210124.0411 Students will arrange the data and information compiled throughout the project and compose a technical research paper. (Research Paper)
- 210124.0412 Students will use a standardized format for composing their research papers. (Research Paper)

210124.05 FORMAL PRESENTATION

- 210124.0501 The student will be able to discuss their findings in a formal presentation before an audience. (Formal Presentations)